The role of preoperative prophylactic antibiotics in hypospadias repair

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Abstract

Introduction: We sought to determine whether the use of preoperative antibiotics is effective in reducing postoperative wound infections and urinary tract infections (UTI) in hypospadias repair.
Methods: We retrospectively reviewed all hypospadias repairs performed at the Montreal Children's Hospital between March 2009 and September 2012. All types of primary hypospadias repairs and redo cases were included. Patients with no adequate follow-up or with missing records of antibiotics were excluded. Preoperative antibiotics were given in the form of cefazolin (50 mg/kg intravenously) when appropriate. Postoperative oral antibiotics were administered as decided by the pediatric urologist. Primary outcomes included postoperative wound infection and UTI. Secondary outcomes included the need for reoperation of hypospadias due to urethrocutaneous fistula, meatal stenosis, urethral stricture and wound dehiscence.
Results: In total, 157 cases of hypospadias repair were reviewed; of these 7 were excluded due to lack of follow-up. Of the remaining 150 patients, 62 received preoperative antibiotics and 88 did not. The groups were well-matched for age, hypospadias characteristics, type of repair and repair of curvature. The group that received preoperative antibiotics had a significantly higher number of stented cases (82% vs. 52% of the non-preoperative antibiotic group). Two cases of wound infection were reported (1 in the preoperative antibiotic group and 1 in the non-preoperative antibiotic group). There was no symptomatic UTI or culture-demonstrated UTI in either group. Moreover, there was no statistically significant difference between the 2 groups in terms of primary outcomes. The complication rate was 11% (17/150 repairs) and all patients needed reoperation. This study's important limitations include the rarity of studied end points combined with the small sample and the retrospective nature of our study.
Conclusion: Our findings do not support the routine use of preoperative antibiotics in hypospadias repair.

Introduction

Hypospadias is defined as an incomplete virilization of the genital tubercle leading to an ectopic opening of the urethra on the ventral aspect of the penis anywhere from the glans to the perineum. Its incidence is about 1/300 in live male births.[1] Surgical repair is the mainstream of therapy and one of the most common procedures performed by pediatric urologists. The aim of hypospadias repair is to achieve normal urinary and sexual function with good esthetic result and self-confidence of the child.[2]

Perioperative and postoperative antibiotics are widely used by pediatric urologists, particularly in hypospadias surgery.[3] The rationale was to reduce the risk of urinary tract infection (UTI) in the early postoperative period following the placement of a catheter,[4-8] Moreover, antibiotics were effective at reducing the risk of meatal stenosis and fistula.[4] Although the potential benefit of antimicrobial prophylaxis is unclear and still controversial, most pediatric urologists administer preoperative and postoperative antibiotics independently of a stent placement.[3]

Little evidence is currently available regarding the effectiveness of preoperative antibiotics in both stented and stentless repair.[6] In our study, we examined the effect of using preoperative antibiotics in reducing the rate of infection after hypospadias repair.

Methods

After ethics board approval, we consecutively reviewed all cases of hypospadias repair between 2006 and 2009. These included both primary and redo hypospadias repair and involved 4 surgeons at the Montreal Children's Hospital, Montreal, Canada. We excluded patients with an incomplete record of antibiotics use and who were lost to follow-up.

Patients were divided into 2 groups, depending on whether or not they had received preoperative antibiotics in the form cefazolin 50 mg/kg intravenously upon anesthesia induction. The surgeon was responsible for choosing which patient was receiving preoperative antibiotics. Similarly, the use of postoperative oral antibiotics was at the surgeon's discretion.

We recorded baseline characteristics, including patient age, type of anatomic defect, presence of associated anomalies, number of previous repairs, type of initial repair, dressing type and duration, operating surgeon and the use of postoperative drainage (with the placement of a stent). Patients who received testosterone prior to the surgery included those with penoscrotal, scrotal or perineal type of hypospadias as well-staged repair.

The use of postoperative drainage, commonly associated with more complex repair, was at the surgeon's discretion. Different sizes of urethral catheters (according to the age of the patient) were used for open drainage. These catheters were removed between postoperative days 7 and 12. Dressings included Tegaderm, Coban (3M, Inc.) or both. These were removed on postoperative day 2.

Pertinent positive and negative symptoms, such as edema, excessive bleeding or any infections, were documented. Patient charts were completely reviewed and screened for emergency visits, phone calls or nursing visits that took place in the postoperative period.

Follow-up consisted of a clinic visit at 3 and then 6 months after the day of the surgery, and then as needed. At these times, pediatric urologists carefully inspected the surgical site for signs of wound infection, fistula, diverticulum, urethral stricture and a normal cosmetic outcome. Urine cultures were not routinely done, and only performed if the patient presented with urinary symptoms. Symptoms, such as extreme irritability or pain, continuous vomiting, fever, hematuria, foul-smelling or cloudy urine in non-toilet trained kids, were considered possible manifestations of a UTI and therefore they were indications to perform urine analysis and culture.

Wound infection and UTI were considered primary outcomes. Wound infection was defined as the presence of swelling, tenderness, increasing redness or drainage of pus from the wound. The pediatric urologist in charge of the patient made the clinical diagnosis. UTI was deemed positive if it showed a bacterial colony count of greater than or equal to 10^5 colony-forming units per mL of a typical urinary tract organism from a midstream sample or 10^4 for catheter-obtained specimens.

Secondary outcomes included the need for a second operation from complications, such as wound dehiscence, urethrocutaneous fistula, meatal stenosis or neourethra stricture.

Statistics

Results were analyzed using SPSS, version 20.0 (SAS Institute, Cary, NC). The chi-square test was used to compare categorical variables. The Fisher test was then added if appropriate. The 2-tailed t-test was used for continuous variables; $p < 0.05$ was considered statistically significant.

Results

Of the 157 cases studied, 7 cases were excluded due to loss of follow-up. Of the remaining 150 patients, 62 (41%) received preoperative antibiotics in the form of cefazolin, while 88 (59%) did not receive preoperative antibiotics. The age of subjects at the time of the surgery ranged from 6 months to 16 years with a median of 2.2 years. The median follow-up was 15 months in both the preoperative antibiotics group and the non-preoperative antibiotic group (range: 3 to 60 months). There was no significant difference in terms of age range and follow-up between groups.

In total, 90% of the cases were primary repairs. The most common primary repairs were the tubularized incised plate urethroplasty (63%) and the meatal advancement and glanuloplasty technique (20%). First stage repair was done in 3 cases. Of the 150 patients, 10% of them (15/150) were redo cases, 3 patients had a second-staged repair for complex proximal hypospadias. There were no differences between the 2 groups on the basis of the type of repair.

Isolated hypospadias was found in 81% of patients (121/150). Genitourinary abnormalities were seen in 19% of cases and this included undescended testes, renal anomalies, hydrocele and inguinal hernia.

Of the 150 patients, an anterior opening was noted in 61%, middle in 15%, and posterior in 13% (Table 1). Chordee was noted in 64% of patients; of these, 76% (73/96) were corrected (72 of them with tunica albuginea plication and 1 by skin graft). No significant differences were noted in meatal location or repair of chordee between the preoperative antibiotic group and the non-preoperative antibiotic group.

Urethral catheters were used in 65% of the studied population. It was reported in 51 of the patients who received preoperative antibiotic (88%) and in 46 patients who did not receive preoperative antibiotic (52%). This was statistically significant ($p < 0.05$).

In the preoperative antibiotic group, 87% of patients received postoperative antibiotics, while 56% of patients in the non-preoperative antibiotic group did ($p < 0.05$). Septra was used in 94% of the cases; other antibiotics included cephalexin, amoxicillin, cefixime and clavulin.

During the early postoperative period, mild edema was seen in nearly all cases with no significant hematomas.

Table 1. Characteristics of the PIPA and the non-PIPA group			
	Preoperative antibiotic group (n=62)	No preoperative antibiotic group (n=88)	*p* value
Meatus			0.55
Anterior	34	58	
Middle	11	12	
Posterior	9	11	
Type of primary repair			0.062
TIP	38	52	
MAGPI	4	26	
Onlay island flap	7	1	
Mathieu	1	2	
Duckett tube	1	0	
First stage repair	1	2	
Redo	7	8	
Repair of curvature			0.085
TAP	31	41	
Skin graft	1	-	
By degloving only	12	8	
Stent			<0.05
Yes	51	46	
No	11	42	

PIPA: preoperative antibiotics; TIP: tubularized incised plate; MAGPI: meatal advancement and glanuloplasty technique; TAP: transversus abdominis plane.

However, 2 cases of wound infection were reported, one the preoperative antibiotic group and one the non-preoperative antibiotic group. The latter was a redo case for a second-stage repair. Pediatric urologists assessed these clinically. The *p* value for primary outcomes for the 2 groups was not statistically significant, 0.66 and 0.53 respectively (Table 2, Table 3).

No culture-demonstrated UTI was identified in either group, and none of the 150 cases presented with isolated symptoms of UTI. Complications included urethrocutaneous fistula (14 patients) and wound dehiscence (3 patients). All of these patients needed corrective surgery. On the other hand, meatal stenosis and neourethral stricture were not observed in this series.

When stratified by primary repair and redo cases, the complication rate was 12% (16/135) and 6.7% (1/15), respectively. In the preoperative antibiotic group and the non-preoperative antibiotic group, the complication rate was 13% (8/62) and 10% (9/88) (p = 0.34). Of the 17 cases in which complications occurred, 16 (94%) received postoperative oral antibiotics. Sixteen of the 17 cases were stented repair. A subgroup analysis was done to examine the rate of complications based on the administration of postoperative antibiotic, and we found no statistical difference in neither of the groups (Table 2, Table 3, Table 4).

Discussion

In our series, we identified no difference in the infectious rate regarding the administration of preoperative antibiotics. There were significantly more people in the preoperative antibiotic group compared to the non-preoperative antibiotic group who received postoperative antibiotic. This is attributable to the retrospective nature of our study. However, this observation did not seem to change our results. Our data suggest that preoperative antibiotics might not be routinely needed, as it does not seem to affect the surgical outcomes of hypospadias repair. More data are needed to determine whether catheterization, redo surgery and the complexity of repair should be considered for decision-making.

The literature to date on hypospadias is heavily weighted in favour of prophylaxis, for both preoperative and postoperative antibiotics use. Practice trends among pediatric urologists suggest that more than 91% of Society for Pediatric Urology members use antibiotics in this setting.[3] Two previous randomized controlled trials looked at infec-

Table 2. Primary and secondary outcomes based on administration of preoperative intravenous antibiotics			
	Preoperative antibiotic group	No preoperative antibiotic group	*p* value
Primary outcome: Infections (n=2)	1/62	1/88	0.66
Secondary outcome: Complications (fistula, wound dehiscence)	8/62	9/88	0.34

Table 3. Primary outcomes based on administration of postoperative oral antibiotics

	Preoperative antibiotic group	No preoperative antibiotic group	*p* value
Primary outcome: Infections (n=2)	1/103	1/47	0.53

Table 4. Stratified analysis of secondary outcomes based on administration of postoperative oral prophylaxis antibiotics

		Preoperative antibiotic group	No preoperative antibiotic group	*p* value
Preoperative antibiotic group	Stent +	7/48	0/3	0.64
	Stent -	0/6	1/5	0.46
No preoperative antibiotic group	Stent +	9/36	0/10	0.085
	Stent -	0/13	0/29	--

tious outcomes of hypospadias repair. Meir and colleagues in 2004 studied 101 stented cases of hypospadias repair. Urine for culture was obtained in both symptomatic and asymptomatic children. The authors recommended the use of broad-spectrum antibiotics before surgery and antimicrobial coverage after surgery until removal of the catheter. The other randomized controlled trial was published in 1983 and conducted by Shohet and colleagues.[8] Both studies arrived at the same conclusion, suggesting that bacteriuria was significantly lower in the group receiving prophylaxis treatment. No case of skin infection was reported in either study.

Unlike these preceding reports, our study looked at the effectiveness of preoperative prophylaxis antibiotics. We also included both stented and stentless repairs. The high rate of infectious outcomes in their study can be explained by the fact that they performed routine urine culture on their patients. We did not conduct asymptomatic urine culture, as recent studies confirmed that the prevention, screening and treatment of asymptomatic bacteriuria is questionable.[9-12]

The role of postoperative antibiotics in stented repair has also been questioned. Growing evidence demonstrates that postoperative antibiotics may not be needed for stented repair.[13] Congruent with our data, Kanaroglou and colleagues did not have any cases of symptomatic UTI, reasserting that infectious complications from hypospadias have a low incidence.

Data on the relationship of prophylaxis antibiotics and hypospadias related complications, such as fistula, meatal stenosis and dehiscence, are also lacking.[6] Our secondary outcome results showed no difference in these complications regardless of preoperative and postoperative antibiotics.

The limitations of our research include the rarity of the studied end points combined with the small sample. However, as such, close to 1000 patients should be studied to achieve a power of 0.8. Selection bias is an important limitation in this study, as preoperative and postoperative antibiotics were administered in a subjective manner. As with any other retrospective review, recall bias and inadequate charting are also potential contributors to misinterpretation. Seven patients had no documented follow-up; therefore, these patients might have faced a complication and presented at another centre, although this would have been unlikely.

This is one of the first studies to question the effectiveness of preoperative antibiotics at reducing infectious complications in hypospadias repair. Given the evidence of a low incidence rate of infectious outcomes in hypospadias repair, we do realize that valuable information could only be gathered through a multicentre involvement.

Conclusion

Our study confirms the low incidence of infectious outcomes in hypospadias repair and suggests the lack of evidence for administration of preoperative intravenous antibiotics for prophylaxis. We therefore recognize the necessity for prospective studies to determine which and when antibiotics should be administered in hypospadias repair. The need of a multicentre analysis or a randomized control trial is indicated.

Competing interests: Dr. Baillargeon, Dr. Duan, Dr. Brzezinski, Dr. Jednak and Dr. El-Sherbiny all declare no competing financial or personal interests.

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